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ORIGINAL ARTICLE

The anatomical relationship between recurrent laryngeal nerve and inferior thyroid artery in thyroidectomy patients.

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ABSTRACT… Objective: To identify the anatomical relationship of recurrent laryngeal nerve with inferior thyroid artery. **Study Design:** Prospective Clinical study. **Setting:** Department of Surgery, Kishwar Fazal Teaching Hospital. **Period:** July 2019 to February 2023. **Methods:** Total 64 patients underwent subtotal thyroidectomies for proven benign goiters were enrolled. **Results:** Out of these 64 patients, 8 were male and 56 were female, male to female ratio 1:7 with median age 34 years. In 64 patients, 128 dissections were performed and in all patients (RLN) and its relation with Inferior Thyroid Artery (ITA) was identified. On right side of neck in 63 (98.43%) patients out of 64 (100%) patients RLN found deeper to ITA and in one (1.56%) patient it was found superficial to ITA. On left side of neck in 61 (95.31%) patients out of 64(100%) patients it was deeper to ITA and in 3 (4.68%) patients the nerve was superficial to ITA. Identification of RLN was difficult in 16 (12.5%) dissections and the reason was adhesions and huge multinodular goiter. **Conclusion:** During thyroid surgery, the connection between RLN and ITA is significant to surgeons. When it comes to RLN security, visible anatomical identification is still the gold standard.

Key words: Inferior Thyroid Artery, Proven Benign Goiters, Recurrent Laryngeal Nerve, Subtotal Thyroidectomies.

INTRODUCTION

The most common endocrine surgery which is performed all over the world is thyroid surgery. The anatomical variations of all organs and structures can occur although these variations are rare, usually found incidentally. During surgical procedures these variations can be a challenge for the surgeon. The large multinodular goiter and malignant thyroid and inflammatory changes may alter the anatomy of the adjacent structures and it becomes difficult to identify the RLN.[1] The injury to RLN have a deleterious effect on patient's quality of life, which ranges from hoarseness of voice to life threatening strider. It is highly vulnerable during thyroidectomies. The prevalence of RLN injury is 0.1 to 6 % or even more during thyroid surgery.[2] The injuries are usually associated with poor identification, distorted anatomy and adhesions.[3] Complications may be avoided if the nerve's location is established by using known markers along the nerve's path.[4]

The recurrent laryngeal nerve and its relationship to the inferior thyroid artery might provide anatomical challenges during thyroid surgery. To prevent iatrogenic damage to the recurrent laryngeal nerve, it is crucial to be familiar with the anatomical features of the area and the link between the recurrent laryngeal nerve and the inferior thyroid artery. Hoarseness, potentially fatal strider, and even death are all possible outcomes after a damage to the recurrent laryngeal nerve. In order to prevent iatrogenic harm during thyroid surgery, the RLN must be located, marked, and dissected fully in the thyroid area, despite the fact that its course is not always uniform.[5] Problems may be avoided if the nerve's location is established by using known markers along the nerve's path.[6] Intraoperative RLN identification may be accomplished in many ways, including palpation, intraoperative nerve monitoring, direct examination, and locating the trustworthy landmark.[7]

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METHODS

This is a prospective clinical study which was conducted in the Department of Surgery Kishwar Fazal Teaching Hospital, Amna Inayat Medical College from July 2019 to February 2023, after taking approval from Ethical Review Committee (27-12-23).

In this study total 64 patients underwent subtotal thyroidectomies, (8 males and 56 females), with male to female ratio 1: 7, with median age of 34 (15-70) years. Fine needle aspiration cytology (FNAC) proven benign goiters were included in the study. Patients having any stage thyroid malignancy and other forms of thyroidectomies were excluded from the study. Pre operatively all patient underwent indirect laryngoscopy to see vocal cord movement. All surgeries were performed by the same team. All thyroidectomies were performed under general anaesthesia. Extra capsular dissection was performed in accordance with accepted medical practice. The middle thyroid vein was ligated, and the superior thyroid vessels were ligated with care to protect the external branch of the superior laryngeal nerve, this allowed the medial rotation of the thyroid. The course of RLN and its relationship with ITA on both side of neck noted whether it was deep or superficial to the ITA. Once identified the course of the nerve was followed up to the point of its entry into the larynx.

RESULTS

In 64 patients who underwent subtotal thyroidectomy for multinodular goiter. Out of these 64 patients 8 were male and 56 were female with male to female ratio was 1:7. The age range of patient was 15 – 70 years with median age 34 years. In 64 patients 128 dissections were performed and in all patients Recurrent Laryngeal Nerve RLN and its relation with Inferior Thyroid Artery ITA was identified. On right side of neck in 63 (98.43%) patients out of 64 (100%) patients RLN found deeper to ITA and in one 1 (1.56%) it was found superficial to ITA. On left side of neck in 61 (95.31%) patients out of 64 it was deeper to ITA and in 3 (4.68%) patients nerve was superficial to ITA. We did not note the nerve course between the branches of ITA. Identification of RLN was difficult in 16(12.5%) dissections and the reason was adhesions and huge multinodular goiter.

n	64
Age	34 (15 – 70)
< 30 years	19 (29.7%)
31 – 40	33 (51.6%)
41 - 50	7 (10.9%)
51 - 60	2 (3.1%)
61+	3 (4.7%)
Male	8 (12.5%)
Female	56 (87.5%)

Table-I. Demographics of patients

Position of Nerve to ITA	Frequency (%)
Right RLN	
Anterior to ITA	1 (1.6%)
Posterior to ITA	63 (98.4%)
Left RLN	
Anterior to ITA	3 (4.7%)
Posterior to ITA	61 (95.3%)

Table-II. Relationship of Right and left RLN with respect to ITA.

DISCUSSION

Since long RLN remains a dilemma for surgeons during thyroidectomy. In the initial years of nineteenth century the thyroid surgery was limited to a few indications the reason was its association with high morbidity and mortality.[8] General anaesthesia and other antiseptic practices were developed and used throughout time. Improvements in surgical techniques and an increased understanding of the anatomy of the thyroid gland have reduced the incidence of problems. Morbidity from thyroid surgery is now less than 1 percent.[9]

Thyroid procedures rely heavily on accurate RLN identification and preservation. Injuries may be avoided during dissection by having a comprehensive understanding of nerve anatomy, including the many paths it might take. As there is a substantial danger (i.e. 10%) of irreversible injury to the nerve so it can be avoided with meticulous dissection and it is preferable to search the nerve carefully.[10] The ITA serves as a solid reference point for localizing the nerve. Nonetheless, the anatomical connection between

the two is not always the same.[10,11] So! there is regional variation.[12]

Modern thyroid surgery relies heavily on the surgeon's familiarity with anatomy and the RLN identification process.[13] In his work, Chinese researchers Costa Maag et al., found that 80% of right and 91.5% of left RLNs migrate posterior to ITA.[14] Jiri Sedy documented a rare anatomical variant: a right-sided twin ITA.[15] Our research shows no evidence of such a difference. On the right side, Rajamadhava et al., discovered the RLN posterior to the ITA in 55% of instances and anterior to the ITA in 40% of cases, whereas on the left side, the ratio was 70% nerve to 20% artery.[16] In 416 neck dissections, Bakht Zada found that 55.27 percent of nerves were located anterior to the ITA and 34.71 percent were located posterior to the artery.[8] Use of intraoperative neuro-monitoring of the RLN as an adjunct to direct visualisation has become standard practise among surgeons for functional evaluation of the nerve.[13]

The RLN may be identified with or without intraoperative neuro-monitoring according to a newly published anatomical characterization, the " Lower Central Triangle," as described by Eunhye Lee et al.[17] The natural movement of the nerve, which Joe Mathew recorded as looping around the aortic arch on the left and the subclavian artery on the right, is very useful once the eyes are trained to spot the nerve during dissection after the thyroid lobe has been rotated medially.[18]

In our study we identified the nerve and its relation with the ITA by careful dissection, direct visualization of the constant landmarks which is in our routine practice. To minimise the potential for damage, almost all surgeons recommend routinely identifying and dissecting RLN during thyroid surgery. During surgery, the nerve is located by using many surgical land markers, including its proximity to the inferior thyroid artery, the tracheoesophageal groove, Berry's ligament, and Zuckerkandl's tubercle.

CONCLUSION

During thyroid surgery, the connection between RLN and ITA is significant to surgeons. When we talk about RLN security, visible anatomical identification is still the gold standard. To protect RLN during thyroid surgery, one must have expert understanding of both the typical architecture of the nerve and artery and the deviations in their route. Other techniques may be used as an adjuvant to the routine standard direct visualization of the anatomy. Therefore, it is concluded that in an environment devoid of technological advancements, the surgeon must possess knowledge of variances in the neurovascular architecture of the thyroid and the essential expertise to recognize the RLN and ITA and avoid the surgical consequences.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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2	Muhammad Tariq Saeed	Design of manuscript.	
3	Sikandar Hayat Gondal	Critical review of manuscript and analysis, methodology content.	
4	Naeemullah Khan	Data collection.	
5	Sharoz Sikandar	Design of data.	
6	Kamran Cheema	Data analysis.	